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| 09/838,316 | 04/20/2001 | Zhiheng Lu | 95153-0110 | 1839 |

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MANELLI DENISON & SELTER
2000 M STREET NW SUITE 700
WASHINGTON, DC 20036-3307

EXAMINER

CHEN, JACK S J

| ART UNIT | PAPER NUMBER |
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2813

DATE MAILED: 12/02/2002

6

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.
09/838,316

Applicant(s)
Lu et al.

Examiner
Jack Chen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Sep 10, 2002
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-33 is/are pending in the application.
- 4a) Of the above, claim(s) 2, 4-20, and 29-33 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 3, and 21-28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on Apr 20, 2001 is/are a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s). 2
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

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DETAILED ACTION

1. In response to the communications dated September 10, 2002, claims 1-33 are active in this application.
2. Claims 2, 4-20 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected Species, there being no allowable generic or linking claim. Election was made without traverse in Paper No. 5 (Note: Mr. Melcher, Attorney for Applicant, has confirmed this election with the Examiner on November 22, 2002).
3. In response to the Amendment dated September 10, 2002, elected claims 1, 3, 21-33 are subject to further restriction and/or election requirement.

Election/Restriction

4. This application contains claims directed to the following patentably distinct species of the claimed invention:

Species I, claim 28 drawn to a method for forming SOI by using silicon ion.

Species II, claim 29 drawn to a method for forming SOI by using germanium ion.

Species III, claim 30 drawn to a method for forming SOI by using inert gases ion.

Species IV, claim 31 drawn to a method for forming SOI by using oxygen ion.

Species V, claims 32-33 drawn to a method for forming SOI by further using oxygen ion to form the buried oxynitride layer.

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Applicant is required under 35 U.S.C. 121 to elect a single disclosed species for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable. Currently, claim 1 is generic.

Applicant is advised that a reply to this requirement must include an identification of the species that is elected consonant with this requirement, and a listing of all claims readable thereon, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which are written in dependent form or otherwise include all the limitations of an allowed generic claim as provided by 37 CFR 1.141. If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a).

Should applicant traverse on the ground that the species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

5. During a telephone conversation with Mr. Jeffery S. Melcher on November 26, 2002 a provisional election was made without traverse to prosecute the invention of Species I, claim 28 (with claims 1, 3, 21-27). Affirmation of this election must be made by applicant in replying to

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this Office action. Claims 29-33 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

6. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(I).

Priority

7. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

8. The information disclosure statement filed June 18, 2001 has been considered.

Oath/Declaration

9. Oath/Declaration filed on April 20, 2001 and January 8, 2002 have been considered.

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Drawings

10. The drawings are objected to because the drawings fail to identify the specific layers/regions, such as amorphous region, buried layer, substrate, etc. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

11. Claims 3, 21-28 are objected to because of the following informalities:

Regarding claim 3, the term "claim I" should change to --claim 1-- for formality.

Regarding claim 3, line 1, the term "the said" should change to --said-- for formality.

Regarding claim 21, line 1, the term "the said" should change to --said-- for formality.

Regarding claim 22, line 1, the term "the said" should change to --said-- for formality.

Regarding claim 23, line 1, the term "the said" should change to --said-- for formality.

Regarding claim 24, line 1, the term "the said" should change to --said-- for formality.

Regarding claim 25, line 1, the term "the said" should change to --said-- for formality.

Regarding claim 26, lines 1 and 2, the term "the said" should change to --said-- for formality.

Regarding claim 27, line 1, the term "the said" should change to --said-- for formality.

Regarding claim 28, line 1, the term "the said" should change to --said-- for formality.

Appropriate correction is required.

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Claim Rejections - 35 USC § 112

12. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

13. Claims 1, 3, 21-28 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 1, line 10, the term "900°" is unclear since there is no given unit.

Regarding claim 27, line 3, the term "all *the buried oxide layer*" lacks antecedent basis.

Claim Rejections - 35 USC § 102

14. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

15. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Griffith, U.S./4,786,608.

Griffith discloses a method for forming a SOI material on a silicon containing substrate having a major surface, which comprises implanting first kind of ions (oxygen ions, fig. 1) at a first dose ($1E18/cm^2$) and a first energy (150-200keV) through said major surface into said silicon containing substrate 10 controlled at a first temperature (400 oC), see col. 3, line 60 to col. 4, line

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29; implanting second kind of ions (silicon ions, fig. 2) at a second dose ($0.5-2E15/cm^2$) and a second energy (120-140keV) through said major surface into said silicon containing substrate at a second temperature below 100 oC (room temperature), to form an amorphous region 22 (fig. 2) beneath the major surface and to keep the original structure in the major surface of said silicon containing the substrate (fig. 2, col. 4, lines 28-55, also see abstract and summary sections); and annealing silicon containing substrate at a third temperature (1150-1250 oC) in the range from 900 oC to below the melting point of silicon, to form a buried layer 13/33 combining the first implanted ions with silicon in the substrate, and a top silicon layer including the said major surface isolated by the buried layer (figs. 3-4, cols. 4-5).

Claim Rejections - 35 USC § 103

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor

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and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103© and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

17. Claims 3, 21-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Griffith, U.S./4,786,608 in view of Ogura, U.S./5,888,297.

Griffith disclosed above in paragraph 15. However, Griffith is silent to use nitrogen ions as the first kind of ions.

Ogura teaches a method for forming SOI, which comprises implanting first oxygen ions or nitrogen ion (fig. 2, abstract and summary sections) into the silicon substrate; and implanting second silicon ions into the silicon substrate (fig. 2, cols. 3-8).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to implanting nitrogen ions having the similar implanting energy, and dosage instead of implanting oxygen ions as taught by Ogura in the method of Griffith in order to form a buried nitride layer for the SOI. Furthermore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Griffith by selecting the suitable implanting energy, dosage and temperature, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

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Regarding claim 3, Ogura shows the first kind of ions is nitrogen ions, so as to form the buried layer as a buried nitride layer.

Regarding claim 21, Griffith ($1\text{E}18/\text{cm}^2$) and Ogura ($2\text{E}17/\text{cm}^2$) both show the first dose is in the range from $1\text{E}16$ - $5\text{E}18/\text{cm}^2$.

Regarding claim 22, Griffith (150-200keV) and Ogura (60keV) both show the first energy is chosen to form enough depth of the buried layer after the annealing process, so as to form a desired thickness of the top silicon layer.

Regarding claim 23, Griffith (150-200keV) and Ogura (60keV) both show the first energy is in the range from 50-400keV.

Regarding claim 24, Griffith (500-600 oC) shows the first temperature is chosen to keep the original structure in vicinity of the major surface on silicon containing substrate in the first implantation process step.

Regarding claim 25, Griffith (500-600 oC) shows the first temperature is in the range from 450-700 oC.

Regarding claim 26, Griffith (120-140keV) and Ogura (150keV) both show the second energy is chosen in the range from 30keV to 5MeV to form an amorphous region beneath the major surface and to keep the original structure in the major surface of the silicon containing structure during the second implantation step.

Regarding claim 27, Griffith (0.5 - $2\text{E}15/\text{cm}^2$) and Ogura ($8\text{E}15/\text{cm}^2$) both show the second dose is chosen in the range from $1\text{E}13$ - $5\text{E}16/\text{cm}^2$ to form an amorphous region beneath

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the major surface containing both a majority of top silicon layer and all the buried layer, which is formed in the annealing step.

Regarding claim 28, Griffith (fig. 2) and Ogura (fig. 2) both show the second kind of ion is silicon ion.

Conclusion


18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jack Chen whose telephone number is (703) 308-5838. The examiner can normally be reached on Monday-Friday (alternate Monday off) from 8:30 am to 6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached on (703)308-4940. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9318 for regular communications and 703-872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.


Jack Chen

November 28, 2002


JACK CHEN
PATENT EXAMINER